

Information Pamphlet No. 2  
(Research Series)

**A Review On Virus  
Diseases of Crop Plants  
by**

**Dr. H. C. GOVINDU,**  
**Plant Pathologist (Res. & Edn),**  
**Agriculture Research Institute &**  
**College, Hebbal**

**Issued by the Farm Information unit, Directorate of  
Agriculture, Bangalore-1**

**1964**

## ERRATA

<i>PAGE</i>	<i>LINE</i>	<i>FOR</i>	<i>READ</i>
2	25	nigronerrosa	nigronervosa
2	26	dissiminated	disseminated
6	1	thesø	these
6	26	lal lab	lab lab
7	22	distribtion	distribution
7	24	whlle	while

1. *Mosaic of sugarcane* :- It was shown that this disease was prevalent in Bombay, Madras, Central Provinces as far back as 1926. Occasionally, the incidence in South was reported as high as 50% during some years. Selection of disease-free setts and intensive roguing of diseased clumps has given good results in the control of the disease.

2. *Grassy-shoot of sugarcane* :- This is reported as a serious disease of sugarcane, which has recently come to light. It appears to be assuming alarming proportions and may become a limiting factor in cane cultivation, if suitable control measures are not developed. This was reported from Bombay on Co. 419 and appears to be prevalent in many fields in Mysore. The disease has been shown to be transmitted by *Aphis maydis*, *Longiunguis sacchari* and *L. Pseudosacchari*. Jowar (*Sorghum vulgare*) has been found to be the alternate host of the virus. Diseases showing symptoms of Albino, yellowing, streaking, chlorosis etc., are found in Mysore, but all of these require a thorough investigation to establish their true nature.

3. *Katte disease of Cardamom* :- This disease has been studied and the insect known as banana aphid—*Pentalonia nigrenserosa*, is known to be the vector. The disease is also dissiminated through planting of virus-infected rhizomes. This disease is mainly confined to Mysore State, but is also reported from Madras and Kerala. Control of katte

disease has been achieved to a considerable extent by roguing of diseased plants and rehabilitation of the plantations with healthy stocks.

It is suggested that better and more effective control could be achieved by : (1) complete eradication of all old and diseased plants, (2) constant and systematic roguing out of diseased plants and (3) transplanting of healthy seedlings raised from healthy stock under disease-free conditions.

4. *Bunchy top of banana* :- This is a serious and destructive disease of Banana recorded from various parts of India and especially from Kerala, where it is very widespread. The insect vector is the banana aphid—the same vector reported for katte of Cardamom. The disease is controlled to some extent by exclusion and eradication methods and to considerable extent by quarantine regulations. The following steps are suggested, in order to successfully tackle the bunchy top of banana disease in India.

(i) (a) *Eradication methods* :- Organised surveys should be made to ascertain the incidence, spread and distribution in various banana growing areas in the country.

(b) The diseased clumps should be regularly destroyed. The campaign of eradication should be taken up especially in areas where the disease is widespread and this should be done by stages on zonal basis.

(c) Replanting of banana should be done

with certified disease-free suckers.

(d) Strict Law (Legislation) should be enforced for prohibiting movement of suckers and leaves from State to State.

(ii) (a) *Investigations to be undertaken :-*

Cultivated banana varieties in the country may be tested against the virus to find the relative resistance.

(b) Explore the possibilities of breeding resistant varieties.

(c) Study relating to the existence of strains of the virus (if any); immunization and fundamental research on collateral hosts could also be taken up.

5. *Banana mosaic* :- Mosaic has been recently shown to be widely prevalent in Bombay State. As this disease as well as bunchy top are more or less restricted to certain parts, strict inter-state quarantine measures are necessary to prevent their spread, where these diseases have not yet obtained a foot hold.

6. *Papaya mosaic* :- This disease is taking a heavy toll of the crop in many parts of the country. It is reported from Andhra Pradesh and parts of Mysore from South. This disease is sap transmissible and nearly four species of aphids are also reported as vectors. So far no effective method of control has

been evolved although eradication of diseased plants is practised with fair amount of success in certain parts of the country. The future line of work would perhaps be to locate possible sources of resistance to the mosaic, so that resistant varieties could be evolved. Resistance could perhaps be found in species of *Carica* or closely related genera.

7. *Tobacco mosaic Virus (TMV)* :- This is very widely present in Deccan and Karnatak and is the most infectious virus disease of tobacco. This is probably the one virus, which is used extensively in Western Countries for studying biochemical, biophysical and chemotherapeutic aspects. Perhaps, some of these aspects could be taken up in our country also.

8. (i) *Leaf curl of Tobacco, Tomato and Papaya* :-

The leaf curl disease on all of the three economic hosts, are one and the same virus and it is transmitted in nature by white-fly-*Bemisia tabaci*. The disease is widespread and is quite a serious problem in many parts of the country. In Mysore, leaf curl disease is severe on tobacco and tomato, while on papaya it is sporadic and is not so serious. The control of leaf curl is very difficult, since the insect vector very easily acquires the virus from the diseased plants and transmit to the healthy plants; further this virus has a

wide host range and many of these hosts are weeds and therefore eradication of these weeds becomes impracticable. The following measures of control perhaps be tried. (a) The possibility of restricting the incidence of disease by regulating the time of sowing in relation to the times of the year when the vector is less numerous may be capable of economic application, especially in case of tomato crop. (b) Breeding of resistant varieties in general is probably an efficient method of control and (c) Use of systemic insecticides offers a possible means of control of insect vector but the efficacy of insecticides has to be investigated.

Other important virus diseases, that are transmitted by white-fly are :-

- (ii) Yellow-vein mosaic of bhendi (*Abelmoschus esculentus*)
- (iii) Leaf curl and enation mosaic of *Hibiscus rosasinensis* and
- (iv) Yellow mosaic of *Phaseolus lunatus* (double bean) and *Dolichos lallab*.

As seen from the above, white-fly is a very important vector in India and it transmits at least four major virus diseases of plants. Yellow vein

mosaic on bhendi causes serious damage to the cultivators. This is reported from several parts of India. In South, it is perhaps common in all parts, wherever the crop is grown. Control measures include periodical roguing, eradication of alternate hosts and spraying with insecticides to control the white-flies.

It is suggested that breeding work to evolve resistant varieties, could be undertaken. It is possible, that some wild species of *Abelmoschus* are immune to this virus. Attempts to utilize such sources of resistance to evolve suitable resistant varieties could perhaps be taken up.

9. *Potato Virus Diseases*:- The investigations on this important crop has not received as much attention as it is being received in the North. As the virus diseases affecting this crop are tuber perpetuated, the only method perhaps of combatting them is the production of disease-free seed stocks. Seed certification, selection of varieties, multiplication of nucleus seed stocks and finally the distribution of seed potatoes to the growers are some of the aspects that are to be considered, while growing virus-free material. Therefore, it becomes imminent, that every State should have a Research Station for itself to produce virus-free seed potatoes of important varieties that are suited for the particular area or region. The nucleus seed stock then have to be transferred to the established sub-stations for further multiplication and distribution

to the cultivators.

10. *Trisetza* and *Xyloporosis* group of Viruses on Citrus:— Recently the trisetza or quick decline diseases of Citrus is known to have become widespread in several States. It has been shown that this disease is transmitted in nature by the aphid, *Toxoptera citricidus*. As in the case of other tree fruits where in most instances, the virus is transmitted through grafting or budding, this means of transmission must be guarded well against here also, lest viruliferous plants be utilized as scion or stock material. Immediate steps should be taken to find out if trisetza and xyloporosis group of viruses are present in South. Therefore, the following suggestions are made for investigations to be taken up :

- (1) Survey of Citrus plantations for virus diseases,
- (2) Study of insect vector,
- (3) Screening of the standardised root-stocks as well as the scions and their different combinations for virus resistance.
- (4) Work to be taken up to study the host range of the virus within the family Rutaceae.
- (5) To find out, if any strains of the virus are involved, and isolation and identification of them.

- (6) Maintenance of nursery (repository,) stocked with indexed material, so that only healthy planting material is supplied to the growers.

11. In addition to the virus diseases described above from South, there are others like little leaf of egg plant, leaf curl of chillies, stenosis of cotton, rosette of peanut, mosaic on members of Cucurbitaceae and Leguminosae and others. Some of these need critical study as regards their distribution, host range, rate and manner of spread, effect on yield and control measures to be adopted. There are still others, which show virus-like symptoms or disorders, which also need a thorough investigation to find out their exact nature of malady. There are several other virus diseases which have yet to be described.

12. *Virus serology*:— This is an important branch of study. In recent times, serological studies are used to identify the viruses and also to differentiate the virus strains. Serological reactions are also helpful in determining the quantitative assay of the virus during multiplication and inactivation. Work in South India on serology is being mainly conducted at the University Botany Laboratory, Madras. It is stated that in this laboratory, the main line of work that is being carried out are; geldiffusion technique physiology of the virus infected hosts particularly nitrogen and carbon metabolism, inhibition of viruses



and studies on soil borne and seed borne viruses-

There is plenty of scope of research to be done in future in this line of specialisation. It is suggested that since the same facilities could not be afforded in all States, perhaps some of the projects of common interest could be co-ordinated. Also purification of viruses, study of their biochemical properties, study of structure of virus in relation to function etc. (refer item No. 7) perhaps be taken up, wherever facilities are available.

### 13. *Identification of new virus diseases:-*

The identification of new virus diseases on the basis of symptoms alone, especially if on a single host may lead to false interpretations. For instance, different viruses may produce similar symptoms on a single host or a single virus may produce dissimilar symptoms on different hosts. Further, a single host may be infected simultaneously by more than one virus and the symptoms expressed may be the result of the combined effect of all or of the effect of only one, the others being latent. In some virus diseases, there is the complication of the existence of strains of the causal virus capable of producing widely varying symptom expressions. In such instances, there is bound to be difficulty in establishing the identity. It is likely that some of the diseases described under separate names will be found to be caused by the same virus or by strains of the same virus. This is perhaps one of the most important line of work to be undertaken because, unless and until exact information is available, most workers will probably follow

the practice of describing diseases on new hosts or in new localities as new diseases.

14. *Starting of regional repository :-* The need for starting such a repository is already briefly discussed (refer item 10). The objectives of starting such a station are :-

1. Serve as a source of propagating material free from virus disease.
2. Serve to secure new varieties developed in other parts of the country to be used for further research.
3. Serve as a source from which all research workers can use the same (disease-free) material.
4. Serve to find out new techniques and methods, which will lead to simplifying indexing procedures.
5. Serve to further research on chemotherapy, hot water treatment etc., to inactivate the virus.
6. serve to separate strains of viruses and study of complex viruses.

The repository in general, would serve to supply better wood of vegetatively propagated fruit trees and other such crops. In brief this repository would be a "blood bank" for better wood.

15. *Study of seed borne virus diseases:-* A few virus diseases, especially the seed borne ones, could be circumvented by obtaining seed from areas where climatic factors preclude, at least slow down, the spread of the diseases. Taking advantage of this, it may perhaps be possible to grow seed of superior quality and supply to the remainder of the country. A detailed discussion is given already (refer item-9). This item of study to some extent may be extended to those of certain seed borne viruses of Cucurbitaceae and Leguminosae. Concerted efforts on the part of grower groups, nursery officials as well as officials of the Department is necessary to eliminate or in the material reduction of infected stock from various nurseries and field or vegetable crops intended for seed certification. These methods when extensively employed, would result in a situation wherein orchardists, potato growers, home gardeners, and others are able to procure a wider choice of virus-free planting stock.

16. *Starting of virus research laboratory :-* It is hardly necessary at this stage to stress the enormous losses caused to economic plants especially to fruits and vegetables by the virus diseases. The virus diseases are also important on ornamental and other economic crops such as pulses, cereals and millets, plantation crops etc. Virus diseases on cereals is almost a new field where practically nothing is known. It is therefore, suggested, that a research Institute in each State be started to take up

the following work :

(1) Identification and nature of the viruses; their distribution host range and rate and manner of spread. (2) Study of their special properties (3) Effect on yield (4) their modes of transmission, (5) the symptoms they produce on different varieties (6) the screening of varieties to discover resistant strains and (7) devising of prophylactic and curative measures. Even though some of the same viruses are present in more than one State, the above aspects of study are to be taken up with reference to this individual crop or crops, since individual diseases of even within limited localities, present their own problems.

It is suggested that the various aspects of study of plant virus diseases should be tackled, as far as possible in coordination with the other Scientific sections, such as, Chemistry, Entomology & Botany. Further the work on the common problems on individual crop or crops relating to different parts of Southern region could also be coordinated.